

**INTERFACE ENHANCEMENT FOR MODULAR PLATFORM APPLICATIONS**

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## **INTERFACE ENHANCEMENT FOR MODULAR PLATFORM APPLICATIONS**

### **Field of the Invention**

**[0001]** Embodiments of the invention generally relate to modular computing systems, such as, systems in accordance or in compliance with the specification of the Advanced Telecom Computing Architecture (ATCA). More specifically, disclosed embodiments relate to enhancing the interface capability of modular platform boards.

### **Brief Description of the Drawings**

**[0002]** The invention is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings, in which the like references indicate similar elements and in which:

**[0003]** FIG. 1 illustrates a perspective view of a modular platform;

**[0004]** FIG. 2 illustrates a perspective view of a modular platform board in accordance with an embodiment of the present invention; and

**[0005]** FIG. 3 illustrates a perspective view of an interface enhancing apparatus in accordance with an embodiment of the present invention.

### **Detailed Description of Embodiments of the Invention**

**[0006]** In the following detailed description, reference is made to the accompanying drawings which form a part hereof wherein like numerals designate like parts throughout, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that

other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. Therefore, the following detailed description is not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims and their equivalents.

**[0007]** Embodiments in accordance with the present invention pertain to enhancing the interfaceability of modular platforms. Modular platform boards are used in a variety of modular platform applications, including, but not limited to, enterprise servers, telecommunications servers, flexi-servers, and the like. One particular example where modular platform boards are being used is for Advance Telecommunications Computing Architecture (ATCA) solutions. ATCA requirements are set forth in the PCI Industrial Computer Manufacturers Group (PICMG) 3.0 ATCA Specification (ATCA Specification), which is targeted to the next generation of carrier grade communication equipment.

**[0008]** **FIG. 1** illustrates an example of a modular platform 48, which may also be referred to as a shelf in some specifications, such as the ATCA Specification. Modular platform 48 may include a chassis 50 and a plurality of high-density modular platform boards 52 vertically positioned in a horizontal array. Modular platform board 52 may be configured with any number of electronic components 58 to accommodate the necessary functionality required. Such electronic components 58 may include, but are not limited to, microprocessors, memory, buses, capacitors, transistors, and the like.

**[0009]** Modular platform board 52 also may have an interface panel 60 and a rear interface (not shown). Interface panel 60 may have one or more interface panel

interfaces, such as active I/O interfaces 62 and passive interfaces 64. Passive interfaces 64 may include, but are not limited to, audible and visual indicators, such as LED lights. Active interfaces 62 may include various I/O connectors, including, but not limited to USB, Institute of Electrical and Electronics Engineers (IEEE) 1394, serial, ethernet, sonnet, and other interface ports, as well as expansion slots for cards such as mezzanine cards. Interface panel interfaces 62, 64 may be in electrical communication with components 58. Active I/O interfaces 62 may enable the modular platform board to interface with a variety of peripheral components and infrastructures, including, but not limited to, LANs, WANs, Internet, switches, routers, bridges, hubs, PBXs, gateways, firewalls, and the like.

**[0010]** Due in part to the density in which modular platform boards may be positioned, the interface panel of a modular platform board is typically very limited in width and height. Many specifications and design requirements set specific parameters for such width and height. Because of the variety of I/O interfaces 62 and passive interfaces 64 that may be required on the interface panel 60, the height 68 and width 66 restrictions allow for only a limited number of interfaces 62, 64. For example, the ATCA Specification limits the height 68 to 350.93 mm and width 66 to 28.95 mm.

**[0011]** The ATCA Specification, and others, further limit the dimensional space, or protrusion distance, in front of the interface panel 60 for connectors, expansion slots, cable routing, and the like. The ATCA Specification limits this space to 95 mm. However, much of this space goes unused due in part to the limited number of interfaces that may be positioned on an interface panel. Embodiments in

accordance with the present invention provide an interface enhancing apparatus that can expand the active and passive interfaces, while observing necessary dimensional restrictions.

**[0012]** FIG. 2 illustrates a perspective view of a modular platform board in accordance with an embodiment of the present invention. An interface enhancing apparatus 10 may be removably coupled to the interface panel 12 of modular platform board 14. Interface enhancing apparatus 10 may be configured to extend orthogonally away from the interface panel 12 and contain a plurality of enhanced interfaces 26 to maximize the number of front side interfaces while remaining within a specified dimensional requirement 30.

**[0013]** Interface enhancing apparatus 10 may include a substantially horizontal component 18 extending from interface panel 12. Horizontal component 18 may include a flex circuit or other power and signal routing form factor such as a printed circuit board (PCB) or other carrier substrate. Horizontal component 18 may be removably coupled to interface panel 12 through an electrical communication interface such as a card edge connector or any other suitable connector, which may include, but are not limited to, various styles of pin and socket type connectors. In addition to wired connections, there could also be some variation of unwired connections, such as infrared, acoustic, light, or RF.

**[0014]** A vertical component 20 may be coupled to horizontal component 18, and extend in a generally parallel manner to the interface panel 12. Vertical component 20 may include a carrier substrate or other power and signal routing device that is in electrical communication with the flex circuit of horizontal component

18. Vertical component 20 may have a plurality of enhanced interfaces 22 that are in electrical communication with the modular platform board 14 and the electronic components disposed thereon via the carrier substrate and flex circuit of vertical component 20 and horizontal component 18, respectively. Enhanced interfaces may include I/O interfaces similar to those suitable for mounting on the interface panel 12, and include, but are not limited to, USB, IEEE 1394, serial, ethernet, sonnet, and other interface ports. A variety of passive interfaces 26 may also be included on the opposite or outward facing edge 24 of vertical component 20, such that such passive interfaces 26 may be observed from a position facing the modular platform board 14.

**[0015]** Vertical component 20 may extend generally parallel to the modular platform board 14 to which it is connected. The carrier substrate in the horizontal component 18 and the vertical component 20 may be continuous, in that the two components need not be separate components.

**[0016]** Where adjacent modular platform boards may use an interface enhancement apparatus in accordance with embodiments of the present invention, the width of vertical component 20 may be sized to be less than or equal to the width of the interface panel 12 to accommodate an adjacent interface enhancing apparatus.

**[0017]** Interface enhancing apparatus 10 may be sized such that the protrusion distance 30 of Interface enhancing apparatus is less than or equal to a maximum distance required by a specification. In the case of the ATCA Specification, the protrusion distance 30 may be less than or equal to 95mm. The space in between

the interface panel 12 and the inward facing edge 28 of vertical component 20 may be reserved for connectors and the routing of cables 32.

**[0018]** To provide additional structural support to vertical component 20, support brackets 34 may interconnect vertical component 20 directly to interface panel 12. Brackets 34 may be removably connected to interface panel 12, such that when interface enhancement apparatus 10 is not required, the brackets 34 need not remain connected to the interface panel 12. Support brackets 34 may assist interface enhancement apparatus 10 resist disconnection at the removable interface as well as other environmental hazards:

**[0019]** It can be appreciated that the enhanced interfaces need not be positioned on the inward facing edge of vertical component 20, but may be positioned about the outward facing edge. **FIG. 3** illustrates a perspective view of an interface enhancing apparatus in accordance with an embodiment of the present invention. Horizontal component 40 may be removably coupled to interface panel 42 of modular platform board 41, and configured with a flex circuit or other routing device that may be in electrical communication with electronic components on the modular platform board 41.

**[0020]** Vertical component 46 may be mechanically and electrically coupled with horizontal component 40. A plurality of I/O interfaces 48 and passive interfaces 50 may be disposed on the outward facing edge 46 of vertical component 44. The aggregate protrusion of interior cables 56, horizontal component 40, vertical component 44 and outer cables 54 may be less than or equal to the allowable

**[0023]**        Though many of the embodiments described herein referred to the requirements of the ATCA Specification by way of example, it is contemplated that embodiments in accordance with the present invention may be applied to other modular platforms that may have modular platform boards and panels that allow for a variety of interfaces, including I/O and indicator interfaces. Further, as the modular platform boards illustrated with embodiments in accordance with the present invention are positioned in a vertical configuration, they are not so limited, and may be horizontally positioned, for example, in a vertical array.

**[0024]**        Also, embodiments in accordance with the present invention may be used to enhance the interfaceability of rear modular platform boards having a series of interfaces, such as I/O and audio-visual interfaces, on an interface panel exposed from the shelf's back side. One such example may be the Rear Transfer Module (RTM) in an ATCA shelf. The RTM may include a modular platform board accessible from the back side of a shelf and may have an interface panel configured with various interfaces. The interface enhancing apparatus in accordance with the present invention may be coupled to such a faceplate to enhance the interfaceability of the RTM.

**[0025]**        Although specific embodiments have been illustrated and described herein for purposes of description of the preferred embodiment, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent implementations calculated to achieve the same purposes may be substituted for the specific embodiment shown and described without departing from the scope of the present invention. Those with skill in the art will readily appreciate that the present



aggregate protrusion distance 52. Additional support brackets 58 may be used to structurally support vertical component 44.

**[0021]** In one embodiment, a horizontal component may be configured to interface with an expansion slot 55 in the interface panel 42. An example of such an interconnection may be through a mezzanine card slot in ATCA modular platform boards.

**[0022]** In accordance with an embodiment of the present invention, the interface enhancing apparatus may be removably coupled to the interface panel. In such a case, the various I/O interfaces of the interface enhancing apparatus may be coupled to the appropriate cabling prior to coupling to the interface panel. This ability to pre-wire may provide interface flexibility with the modular platform boards. For example, typically, the modular platform may have a certain number of primary modular platform boards and the same number of redundant modular platform boards. If a primary modular platform board fails, the redundant modular platform board can serve as a backup. Where an interface enhancing apparatus is coupled to a primary modular platform board, should a failure occur in that board, the interface enhancing apparatus, which may be fully connected to external sources, may be quickly and without deenergizing the system switched to the redundant modular platform board. Similarly if a modular platform board needs to be swapped for a different board, there the interface enhancing apparatus need only be decoupled from the modular platform board being changed out and recoupled to the new modular platform board without having to disconnect and reconnect cables connected the enhanced I/O interfaces.

invention may be implemented in a very wide variety of embodiments. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.